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Murrumbidgee to Googong Water Transfer Project - Air Quality Management Plan

BWA-M2G-EN-ECP-006-1

16th January, 2012

Delivered by the Bulk Water Alliance

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Abbreviations – List of Abbreviations

Abbreviation	
ACT	Australian Capital Territory
EWMS	Environmental Work Method Statement
BWA	Bulk Water Alliance
CEMP	Construction Environment Management Plan
TAMS	Territory and Municipal Services
EPA	Environmental Protection Authority (NSW)
E&SD	Department of Environment and Sustainable Development (ACT)
CESM	Community Engagement Stakeholder Management
ACTPLA	Australian Capital Territory Planning and Land Authority
M2G	Murrumbidgee to Googong Water Transfer Project
CEMP	Construction Environment Management Plan
AQMP	Air Quality Management Plan

Environmental Commitments and Approval Conditions

Table 1.1 M2G EIS Commitments

No.	Commitment	Reference
107	A detailed air and dust management sub-plan will be included as part of the CEMP to minimise potential impacts to air quality.	Air Quality Management Plan (AQMP)
108	Mitigation measures that will be incorporated into the CEMP to minimise the impact to local air quality from the proposed construction activities. *Dust generation by vehicle movement and construction activities* • Implementation of dust control measures, monitoring and reporting requirements into the construction environmental management plan; • Installation of dust deposition gauges at sensitive locations to track performance of the dust suppression actions against the Air Environment Protection Policy guidelines; • Covering dirt, sand, soil or other loose material while in transport, or maintain at least two feet of vertical space between the top of the load and the top of the trailer; • Minimising drop heights from front end loader buckets and trucks that carry excavated materials; • Careful loading of haulage trucks so that material does not fall from truck bodies; • Cleaning up of any material spillage on roads immediately; • Limiting construction vehicle speeds on unsealed roads; • Restricting truck movements to designated roadways; and • Incorporating brush-down methods of the surface of vehicles where necessary. *Dust generation during operation of construction machinery* • Use of water during drilling activities; and • Checking of weather conditions (such as wind strength and direction) prior to major potential dust emitting activities. *Dust generation from wind erosion* • Implementation of dust suppression techniques (such as water carts) on disturbed areas; • Ceasing or altering works in periods of very high winds where dust suppression techniques are insufficient in	Sections 4.2.2, 5 of AQMP

No.	Commitment	Reference
	managing dust generation; • Covering of soil stockpiles and other bare areas that are expected to be exposed for prolonged periods (e.g. through stabilisation with vegetation, mulch material or geotextiles); • Installation of wind barriers where necessary; • Minimising the area of vegetation removal or disturbance as much as possible, and revegetation of cleared areas as soon as practicable and • Minimising potential high dust generating activities to times that exclude adverse wind conditions. *Particulate and other combustion emissions from construction and haulage vehicles* • Use of energy-efficient and well-maintained earthmoving equipment; • Use of equipment in the most economical ways by reducing idling times and ensuring efficient work flow processes; and • Minimising the amount of transportation (of materials, spoil and personnel) required through provision of viable personal transport options and maximising the amount of spoil reuse.	
109	Water for dust suppression will be sourced from the Murrumbidgee River, under licence.	Section 5 of AQMP

Table 1.2 M2G DA Conditions (NSW)

No.	Condition	Reference
Air Quality Impacts Condition No. 2.34	The Proponent shall construct and operate the project in a manner that minimises dust emissions from the site, including wind-blown and traffic-generated dust. All activities on the site shall be undertaken with the objective of preventing visible emissions of dust from the site. Should such visible dust emissions occur at any time, the Proponent shall identify and implement all practicable dust mitigation measures, including cessation of relevant works, as appropriate, such that emissions of visible dust cease.	Section 5 of AQMP Table 5.1
Odour Condition No. 2.35	The proponent shall not cause or permit the emission of offensive odours from the site in accordance with the provisions of Section 129 of the *Protection of the Environment Operations Act 1997*.	Section 5 of AQMP Table 5.1 A23

Table 1.3 M2G DA Conditions

No.	Condition	Reference
Condition B6 (e)	An Air and Dust Management sub-plan to implement the mitigation measures to control dust from exposed areas, stockpiles, plant equipment and unsealed roads be endorsed by EPA.	Air Quality Management Plan (AQMP)

Table 1.4 ACT Environmental Authorisation 802 Conditions

No.	Condition	Reference
18.1	Air Monitoring (a) Air monitoring on the site shall be carried out in accordance with Schedule 2. Table 1, Condition 1.	Appendix A of AQMP
Schedule 2, Table 1 – Air Pollution		
1	Visual monitoring of dust and exhausts shall be undertaken at all times, and where visible dust emissions occur, the Authorisation holder shall identify and implement all practicable dust mitigation measures.	Section 8.3, Appendix A
2	The Authorisation Holder shall ensure that dust emissions from the site are minimised, including wind blown and traffic generated dust.	Section 5.2
3	A water cart or alternative methods as approved by the Authority shall be used on site to suppress dust.	Section 5.2
4	Water or alternative methods as approved by the Authority shall be applied to stockpiles, work areas and unsealed roads.	Section 5.2
5	Water application rates shall be aligned with the prevailing climatic conditions, particularly temperature, rainfall and wind speed/direction.	Section 5.2
6	Disturbed areas shall be stabilised and revegetated as soon as possible to minimise exposure times of bare earth.	Section 5.2
7	All sealed roads shall be swept of dust at regular intervals, including public roads where there is evidence of material deposition related to the works.	Section 5.2
8	Working in extremely dry windy conditions shall be avoided.	Section 5.2
9	The transportation of all materials and substances used to carry out the activity shall be covered during movements to and from the site.	Section 5.2

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1 Introduction

1.1 Background

The Murrumbidgee to Googong (M2G) Water Transfer is one of the recommended options for delivering improved security to the water supply for the ACT and region. It involves pumping water from the Murrumbidgee River (within the ACT) and transferring it via a 12km pipeline to Burra Creek (in NSW), from where it would flow for approximately 13km to the Googong Reservoir.

This plan has been designed to address client expectations and requirements, and adequately address risks and stakeholder concerns. The BWA is committed to providing the services it offers in a manner that conforms to the contractual requirements and to all relevant regulatory and legislative requirements.

The BWA will ensure that the controls are properly implemented and are regularly monitored and audited to assess their effectiveness. Changes to the stipulated controls will be instigated if they are not achieving their objectives.

The project comprises the following key features:

Infrastructure	Description
Intake/low lift pump station	The intake/low lift pump station will comprise a concrete box structure built into the riverbank. The low lift pump station will include a screen, grit collection and removal, pumps and valves and filtration to prevent fish transfer.
High lift pump station	The pump station will pump water to a high point at Gibraltar Range, from where it will run under gravity to the discharge point. The high lift pump station will consist of a building enclosing a pump hall and electrical services and an amenities area.
Pipeline	The pipeline will transfer the water from the low lift pump station to the high lift pump station, then onto the outlet structure. It will be constructed of 1016 mm diameter steel pipe. The pipeline will be approximately 12 km long, with the pipe located approximately 1.8 m to 4 m below ground level. Air valves and scour valves will be located at regular intervals along the pipeline to provide pressure relief and to allow cleaning.
Outlet structure	The outlet structure will take the form of a weir box arrangement located on the bank of Burra Creek. It will comprise a rectangular concrete box approximately 12 m along the creek bank with a 250 mm grated opening along the west bank of Burra Creek. Water will flow into the weir box from the pipeline and will discharge over the weir and run down the creek bank to the creek, which flows to Googong Reservoir. This method of discharge is designed to minimise scouring of the creek bed near the outlet.
Electric power supply	The electrical infrastructure will comprise a 132 kV/11 kV substation in Williamsdale and a single 11 kV cable to the high lift pump station.
Mini-hydro power generator	Electricity provided by the grid will be supplemented by electricity generated by a mini-hydro electric power facility which will be constructed as part of the project.

Table 1.1 Key features of the M2G pipeline project

Construction of the Murrumbidgee to Googong Water Transfer Project (M2G) has the potential to significantly impact local air quality if not managed effectively. Particulate and gaseous emissions associated with earthworks, crushing, vehicle exhausts, wind erosion and other construction activities have the potential to degrade air quality and potentially impact the environment, local amenity, safety, and in extreme cases human health.

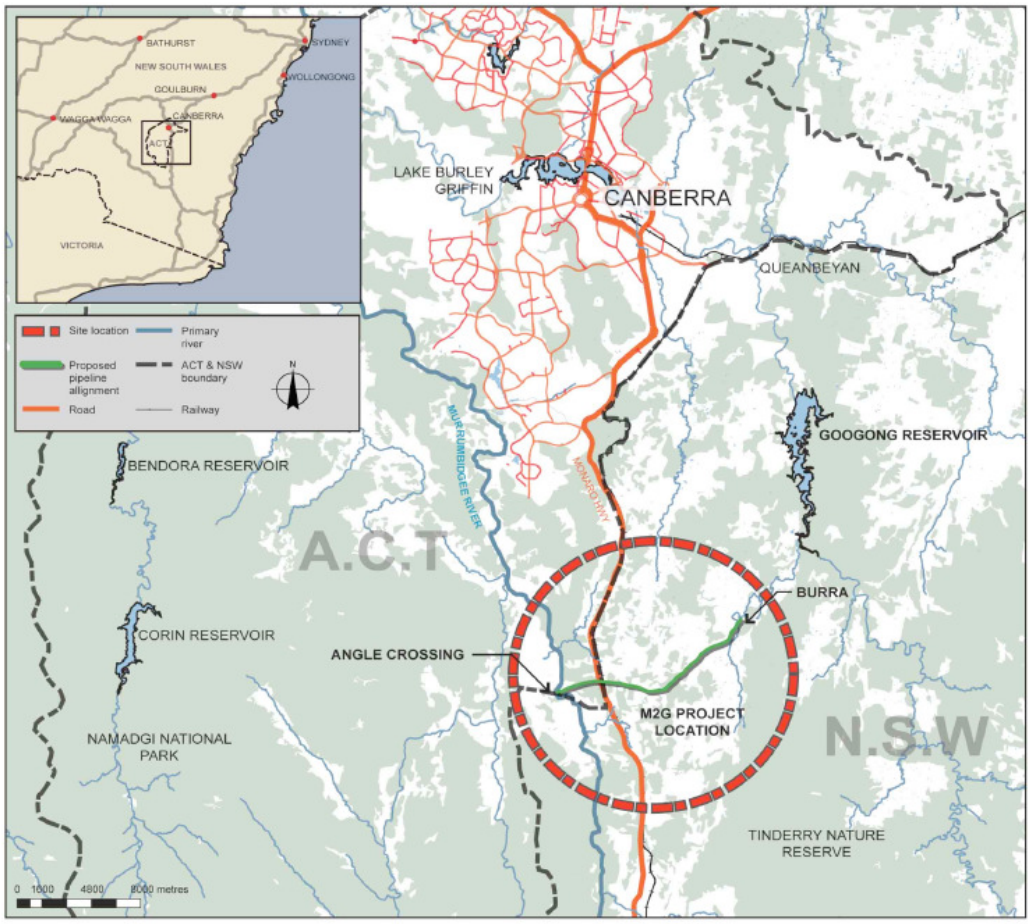


Figure 1.1 Regional setting of the M2G pipeline

1.2 Purpose

The primary purpose of the Air Quality Management Plan (AQMP) is to outline and identify air quality impacts associated with construction of the M2G water transfer project, and detail the management strategies that will be implemented on site to mitigate and manage these impacts.

The AQMP forms a component of the overarching Construction Environmental Management Plan (CEMP) detailing how environment management strategies and procedures will be integrated into construction activities. It is envisaged that the implementation of both the CEMP and AQMP will ensure that all legislative requirements and project approvals are met during the construction process.

1.3 Objectives

The main objectives of this AQMP is to ensure that fugitive emissions associated with construction activities (dust emissions, odours and gaseous emissions) are controlled to an acceptable level and do not result in any legislative breaches, environmental degradation or public nuisance complaints.

Air quality objectives relevant to the M2G project will focus primarily on particulate matter and odour. Gaseous emissions such as those generated by vehicle exhausts are not considered to present a significant risk to the environment and community and therefore air quality objectives for construction are not

appropriate. However, measures to reduce the potential impact of these emissions have been included in Section 5 of this plan.

Construction air quality objectives will revolve around the principle of “best practice” and target goals recommended in the ACT Air Environmental Protection Policy and by the NSW Environment Protection Authority, (EPA) detailed in Table 2.2, NSW EPA Criteria for Dust Fallout.

As a result, onsite air quality objectives for the M2G project include:

- Undertaking construction activities in a manner that minimise potential dust impacts on the environment and sensitive receivers;
- Maintaining depositional dust levels within EPA (NSW) and E&SD (ACT) recommended goals;
- Educating personnel on effective dust management practices and improve general awareness;
- Ensuring no environmental infringements are received due to construction air quality emissions;
- Ensuring no community complaints are received due to construction air quality emissions; and
- Continuing to drive cultural change towards proactive environmental management on site.

1.4 Performance goals

The performance goals of this AQMP are:

- Zero community complaints regarding fugitive emissions generated by construction activities
- Zero environmental fines or prosecutions relating to air quality impacts.
- Prevent degradation of the surrounding environment through the application of best management practices and innovation;
- No decrease in surrounding air quality;
- Comply with and improve on ACT and NSW air quality standards;
- Continue to develop and improve construction activities and methodology to minimise dust impacts potentially resulting in innovative changes to the construction process
- Work areas will be kept to the minimum area necessary for safe working operations to minimise exposed surfaces.

2 Legislative & Regulatory Compliance

2.1 Relevant Legislation

Table 2.1 Legislation

Legislative Jurisdiction	Relevant Act
Commonwealth	*Environmental Protection and Biodiversity Conservation Act 1999*
Territory (ACT)	*Environmental Protection Act 1997*
New South Wales	*Protection of the Environment Operations Act 1997*

2.2 Guidelines and Standards

The following guidelines and standards are applicable to air quality management on site:

Commonwealth

- *National Environmental Protection (Ambient Air Quality) Measure (2003)*
- AS 2922 Ambient Air Guide for Siting of Sampling Equipment
- AS 3580.10.1-1991 Methods of Sampling Analysis of Ambient Air.

NSW

- Approved methods for the sampling and analysis of air pollutants in NSW (*EPA, 2005)*

ACT

- *Environmental Protection Guidelines for Construction and Land Development in the ACT*, Environmental Protection Authority, ACT, 2007 (pg. 37)
- *Air Environmental Protection Policy (1999)*

2.2.1 Particulate Matter

Air borne particulate matter is any material, except uncombined water, that exists in the solid or liquid state in the atmosphere or gas stream or standard condition. Air borne particles generally range in size from 0.001 – 500 µm (micron), with the bulk of the particulate mass in the atmosphere ranging from 0.01 – 10 µm.

Common size related terms are the classes Total Suspended Particulate Matter (TSP), PM_{10} and $PM_{2.5}$. Total Suspended Particulate Matter (TSP) refers to the concentration of all particles in the atmosphere. PM_{10} refers to all particles with aerodynamic sizes less than 10 µm and $PM_{2.5}$ is all particles with aerodynamic sizes less than 2.5 µm.

Particulate matter is largely generated by industry, motor vehicles, refuse disposal, ocean salt, volcanic ash, products of wind erosion, roadway dust and bushfires. Particulate matter presents a health hazard to the lungs, reduces visibility, increases the chances of precipitation and reduces solar radiation. The health impacts of particles are generally related to the extent to which they can penetrate the respiratory tract. Larger particles (those greater than 10 µm) generally adhere to the mucus in the mouth, noise, pharynx, and larger bronchi and are generally removed by swallowing and expectorating.

Respirable particles are particles with an aerodynamic size less than 5 µm. Particles below 2.5 µm can reach the deepest parts of the respiratory system, where they can only be removed by the body's cellular defence system. Consequently, respirable particles have been associated with a wide range of respiratory symptoms.

The effects of particulate matter on health and amenity can be assessed by comparing dust deposition rates and dust concentrations with recognised air quality criteria. Air quality objectives quoted in the following sections have been sourced from the NSW Environment Protection Authority (EPA) publication – Approved Methods for the Modelling of Air Pollutants in New South Wales (2005).

The NSW EPA notes National Health and Medical Research Council (NHMRC) and National Environment Protection Council (NEPC) Guidelines and World Health Organisation (WHO) long term goals. The New South Wales EPA criteria for dust deposition and particulate matter concentration are outlined in the following sections.

2.2.2 Dust Deposition

Depositing dust, if present at sufficiently high levels, can reduce the amenity of an area. In NSW, the EPA sets limits on acceptable dust deposition levels. Table 2.2 shows the maximum acceptable monthly increase in dust deposition over the existing dust levels taken as an annual average.

Table 2.2 NSW EPA (2005) Criteria for Dust Fallout

Existing dust fallout level (g/m^2/month)	Maximum acceptable increase over existing fallout levels (g/m^2/month)
2	2
3	1
4	0

The table above details the maximum acceptable increase in dust deposition over the background dust levels. The maximum acceptable increase in the mean annual dust deposition rate is 2 g/m^2/month in those areas where the existing dust fallout rate does not exceed 2 g/m^2/month. **The aim of the dust fallout criteria is to limit the total dust deposition rate to 4 g/m^2/month**. However, this dust criteria needs to be considered against existing dust levels. It should be noted that in the ACT, the EPA are concerned with preventing dust nuisance (complaints) and no specified dust limits are applicable.

2.2.3 Odour

With regards to odour standards referred to in Table 1.3, while these are taken from the NSW EPA publication *"Approved Methods and Guidance – For the Modelling and Assessment of Air Pollutants in NSW"* the *EPA Draft Odour Policy – Management and Assessment of Odours from Stationary Sources, May 2001* provides more information with regards to odour assessment in NSW.

Table 2.3 Odour Performance Criteria

Population of Affected Community	Odour Performance Criterion (OU/m^3)*
Urban (≥ ~ 2000)	2.0
~ 500	3.0
~ 125	4.0
~ 30	5.0
~ 10	6.0
Single Residence (≤ ~ 2)	7.0

*OU/m^3-odour units

2.3 Conditions of Approval

The Conditions of Approval relevant to the management of air quality are detailed in **Tables 1.1 – 1.4** of this document.

2.4 Licences & Permits

Tables 2.4 and **2.5** identify the approvals, permits and licences relevant to air quality that are required for the project.

Table 2.4 Approval Requirements for NSW

Aproval Required	Relevant Legislation	Authority
Environment Protection Licence	*Protection of Environment Operations Act. 1997*	Department of Environment and Sustainable Development (E&SD))

Table 2.5 Approval Requirements for the ACT

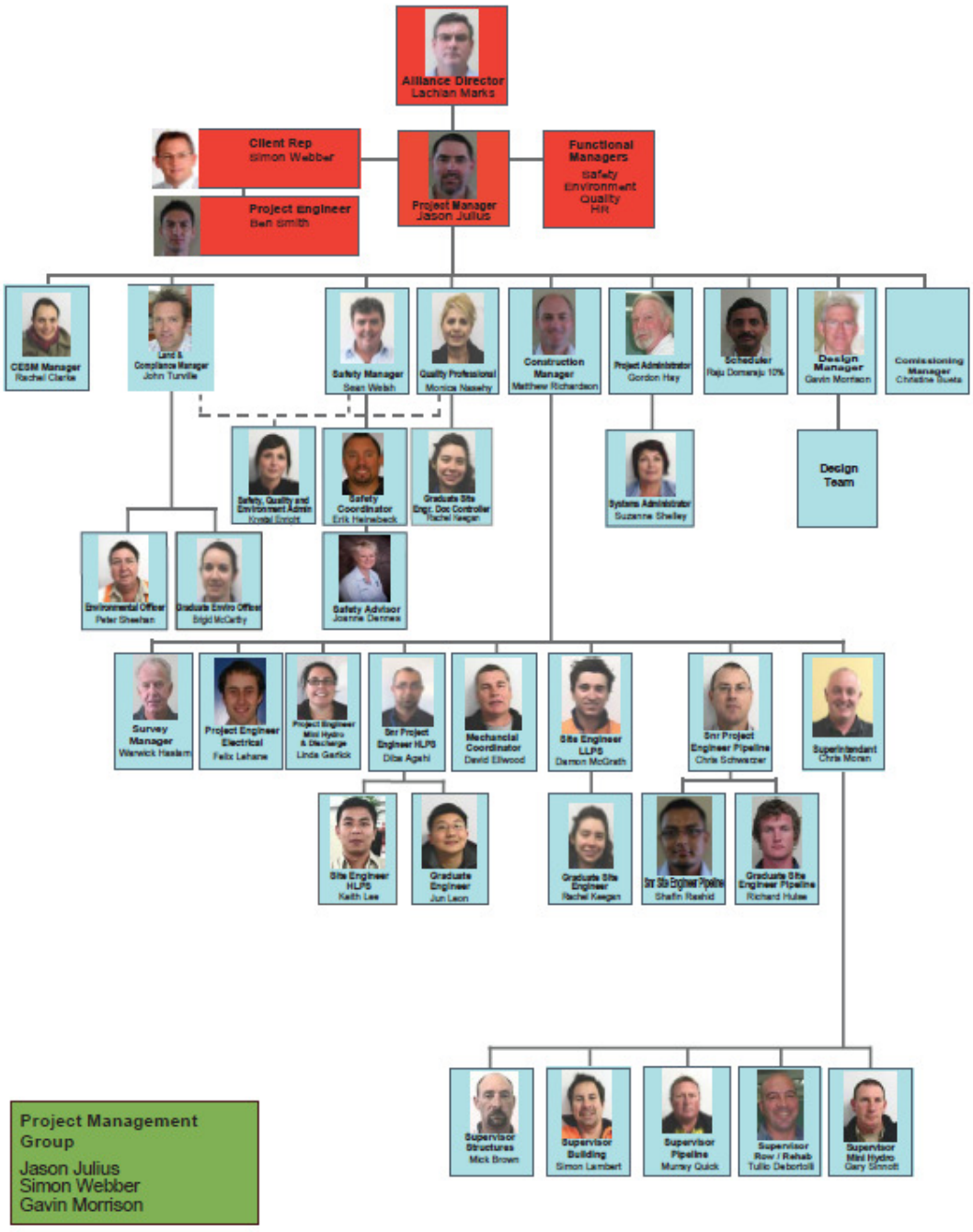
Approval required	Relevant Legislation	Authority
Environment Authorisation	*Environmental Protection Act 1997*	E&SD (Environment Protection Authority)

3 Structure and Responsibilities

3.1 Site Structure

The general project structure for the management of air quality issues is shown in Figure 3.1 below.

Figure 3.1 Murrumbidgee to Googong Management Hierarchy



3.2 Responsibilities

The responsibility and authority pertaining to environmental performance of the M2G personnel and subcontractors are detailed below.

3.2.1 M2G Project Manager

The M2G Project Manager has the role of ensuring that the project is delivered on time, within budget and is consistent with the aims and objectives of the BWA. This role is accountable for all aspects of the project including safety, environment and heritage, quality, budget and overall delivery of the project. The M2G Environmental Manager will be working in conjunction with the M2G Project Manager to ensure that the BWA's prescribed environmental outcomes are achieved.

3.2.2 M2G Construction Manager

The M2G Construction Manager is responsible for delivery of the construction phase of the project to ensure that environmental and heritage impacts are minimised and specific obligations are met.

3.2.3 M2G Environment Manager

The M2G Environmental Manager has overall responsibility for managing the environmental aspects of the M2G project and delivering the project in accordance with the approved environmental management plans and to relevant environmental legislation and to licence / approval conditions.

3.2.4 M2G Environmental Officer

The M2G Environmental Officer has primary on-site responsibility for managing all aspects of environmental management and compliance for the construction phase of the project, as delegated by the M2G Environmental Manager. This position reports directly to the M2G Project Manager and the M2G Environmental Manager.

The key responsibilities of the M2G Environmental Manager and Environmental Officer will be to:

- Liaise with designers and construction manager with regard to construction program and activities on site;
- Review the AQMP prior to the start of construction;
- Implement the BWA Environmental Management System (EMS);
- Maintain, assess and monitor the implementation of the AQMP;
- Ensure that all project environmental obligations are met;
- Ensure no work requiring a licence or permit is undertaken without such documentation;
- Complete environmental checklists;
- Provide input and advice to engineers on Environmental Work Method Statements (EWMS);
- Identify and prepare environmental induction and training materials;
- Liaise with government agencies and relevant stakeholders;
- Provide a regular construction program identifying critical construction activities;
- Manage the environmental budget;
- Respond to environmental incidents;
- Manage environmental sub-consultants;

- Oversee the maintenance of environmental documents;
- Prepare reports on compliance;
- Monitor revegetation activities within the project boundary; and
- Liaise with the CESM Manager to provide technical input to community engagement and stakeholder management activities.

3.2.5 Engineers

Project and Site Engineers are responsible for ensuring that environmental considerations are integral to the decision making for all construction Activities. Engineers will liaise closely with the M2G Environmental Officer to ensure that the environmental controls and procedures contained in the AQMP are implemented. Engineers will conduct regular checks of the site to ensure dust and odour mitigation measures are functioning effectively.

Roles and responsibilities for both the Project and Site Engineers, in respect to environmental matters, will differ depending on the Activity being undertaken. Specific details on particular environmental responsibilities are included in each EWMS.

Where applicable, the engineers will be responsible for ensuring that any work performed by external parties meets with the requirements of this AQMP including identifying and documenting the environmental risks of the proposed works.

3.2.6 Superintendent and Foremen

Superintendents and Foremen report to the Project Engineers and will have a direct role in the compliance and implementation of environmental procedures and controls on site. They will also be responsible for checking the site on a regular basis and ensuring that dust mitigation measures are being undertaken to minimise environmental impacts and that personnel are provided with appropriate environmental training, prepared by the Environmental Team.

Where applicable the Superintendents/Foremen will be responsible for ensuring that any work performed by external parties meets with the requirements of the AQMP, including identifying and documenting the environmental risks of the proposed works.

3.2.7 Subcontractors

The BWA recognises that it is often subcontractors that present the greatest environmental risks to a project due to:

- Their detachment from the main construction delivery teams, and therefore the potential for poor communication regarding environmental risks;
- The large number of subcontractors on site; and
- Subcontractors operating under a different management system from the BWA.

The BWA acknowledges its responsibility to ensure that all persons on the project including subcontractors and their employees comply with the relevant environmental requirements. As a minimum, subcontractors and their employees will be required to comply in full with the AQMP. All subcontractor personnel are considered equivalent to BWA personnel in all aspects of environmental management and control, and their responsibilities in this respect mirrors those of BWA personnel.

M2G environmental requirements will be included in the selection and management of subcontractors working on site. This will include appropriate references to site specific environmental management requirements within subcontract documentation.

Subcontractors working on the project will be required to:

- Undertake the on site induction and where required participate in relevant environmental training and toolbox sessions;
- Observe subcontract and statutory requirements relating to environmental protection and other environmental legislation and to follow instructions issued by the BWA management and supervisory personnel;
- Nominate site representatives to liaise with M2G site representatives with respect to environmental requirements associated with their Activity. This representative must have the authority to administer and implement any outcomes/management strategies identified during such consultations;
- Adhere to the BWA management system as it applies to their operations on site;
- Co-operate fully with site emergency incident procedures and consultative arrangements; and
- Be familiar with, and adhere to, procedures incorporated in the AQMP and associated sub-plans with regards to environmental management and legislative compliance; and
- Display a drive towards the implementation of "Best Management Practices" and the principles of sustainability during day-to-day operations.

The work of subcontractors will be monitored through the site inspection process detailed in Section 8 below. Observations will be made by relevant personnel (listed above) to assess the effectiveness of the environmental protection measures being used by the subcontractors and to determine compliance with the requirements of the AQMP. Any non-conformances or improvements identified during these inspections will be documented on an Environmental Maintenance, Observation and Action List for minor non-conformances/improvements or an Environmental Improvement Notice (EIN) for significant non-conformances.

3.3 Resource Requirements

Adequate resources will be made available to ensure that environmental controls and mitigation measures detailed in the AQMP are effectively implemented on site.

Potential resources may include:

- Personnel;
- Dust suppressant agents (such as water and/or chemical binders, etc);
- Dust barriers and/or screens;
- Water distribution systems (such as water carts and sprinklers);
- Aggregate and seals for stabilising haul roads and access tracks;
- Rumble grids and wheel washing facilities; and
- Street sweepers.

4 Environmental Aspects and Impacts

4.1 Environmental Aspect, Impact and Risk Identification

Environmental aspects as referred to in this document are those activities associated with the project that have the potential to cause, or result in, adverse environmental impacts. Due to the complexity of the project, it is conceivable that various aspects of the project would carry a varying degree of environmental risk which needs to be managed accordingly.

Effective environmental management should be proactive rather than reactive. In order to facilitate a proactive style of environmental management, a risk management style of assessment has been utilised to identify and assess environmental aspects associated with the project, and to implement appropriate mitigation strategies to minimise the likelihood of environmental risks associated with each aspect. This process involves:

- Identifying the risk/aspect
- Analysing the risk/aspect (determining likelihood and consequence)
- Evaluating the risk/aspect
- Treating the risk

All identified aspects are assessed based on the risk assessment matrix (Table 4.1). Risk assessment is based on (1) the likelihood of an impact occurring as a result of the aspect; and (2) the consequences of the impact if the event occurred. Following this assessment, each impact is assigned a risk category which ranges from “low” (low likelihood and consequence) to “extreme” (high likelihood and consequence). Table 4.2 describes each level of risk.

A risk category identified as having an extreme or high risk (a significant impact) may be downgraded if appropriate environmental controls and measures are implemented and maintained. Proactive planning, installation and maintenance of appropriate environmental controls and ongoing monitoring will reduce the risks associated with each environmental impact identified for the project. Table 4.3 details the environmental aspects identified for the project, the initial risk category prior to appropriate management strategies, the proposed management strategy and a revised risk category.

Table 4.1 Risk Scoring Matrix

		Consequences				
	Likelihood	1	2	3	4	5
		Negligible discharge	Uncontrolled Discharges in minor quantities	Moderate breach of environmental Statutes	Major breach of environmental statutes	Shutdown of project due to Environmental breach
A	Almost Certain	H	H	E	E	E
B	Likely	M	H	H	E	E
C	Moderate	L	M	H	E	E
D	Unlikely	L	L	M	H	E
E	Rare	L	L	M	H	H

Table 4.2 Risk Definition and Classification – Qualitative Measures and Likelihood Scale

Level	Categorisation Of likelihood	Description
A	Almost certain	Is expected to occur during the project, 90% or > probability
B	Likely	Will probably occur during the project, ~50% probability
C	Moderate	Might occur at sometime during the project, ~10% probability
D	Unlikely	Could occur at some time during the project, ~1% probability
E	Rare	Only occur in exceptional circumstances, < 1% probability

Table 4.3 Key Aspects, Potential Impacts and Risk Analysis for the Proposed M2G Project

Aspect	Potential impact	Initial Risk Category	Environmental Control Measure (Refer to Table 12)	Revised Risk Category
Vegetation Clearing	Excessive vegetation clearing resulting in exposed areas susceptible to wind erosive factors.	Medium	(A7) (A8) (A17)	Low
	Topsoil stockpiles located within close proximity to sensitive receivers	Low	(A1) (A4) (A6)	Low
	Topsoil stockpiles susceptible to wind erosive factors.	Medium	(A9) (A15) (A17) (A21)	Low
Site Establishment	Roads and access points within close proximity to sensitive receivers.	Medium	(A1) (A3) (A10) (A14) (A15) (A16) (A18) (A28)	Low
	Site entrance/exit points within close proximity to sensitive receivers.	Medium	(A1) (A16) (A18) (A28)	Low
	Excessive areas of vegetation cleared for the establishment of roads, access tracks and site compounds.	Low	(A7) (A8) (A17)	Low
Bulk Earthworks	Excessive dust generated by earthworks equipment (excavators, dozers, graders, etc)	Extreme	(A11) (A12) (A13) (A14) (A16) (A23)	Low
	Excessive emissions (smoke) generated by construction equipment, light vehicles and earthwork plant.	Medium	(A11)(A12) (A13)	Low
	Excessive dust generated by road use and light vehicle access tracks.	High	(A3) (A10) (A15) (A16)	Low
	Excessive dust generated off unsuitable stockpiles	Medium	(A6) (A9) (A17)	
	Excessive dust generated off completed batters and earthworks operations	Medium	(A17)	Low
	Excessive dust generated by construction activities occurring on windy days	High	(A11) (A15) (A17)	Low

Aspect	Potential impact	Initial Risk Category	Environmental Control Measure (Refer to Table 12)	Revised Risk Category
	Excessive dust on roads generated by spoil being tracked onto roads	Medium	A19	Medium
Blasting and Crushing Operations	Excessive dust generated by blasting operations	High	(A29) (A30)	Medium
	Excessive dust generated by crushing and stockpiling operations	High	(A26) (A27)	Medium
	Excessive dust generated by temporary stockpiles exposed to erosive wind factors	Medium	(A26) (A27)	Low
General	Sediment tracked onto public roads resulting in the generation of excessive dust impacts	Medium	(A3), (A18), A19, A20	Low
	Trucks leaving the site with excess sediment on undercarriage, wheel arches, etc	Low	(A19) (A20)	Low
	Trucks entering and exiting the site with uncovered loads	Low	A18	Low
	Excessive speeds on access tracks generating dust impacts	Medium	A16	Low
	Unsuccessful revegetation of exposed areas	Low	A17	Low

The risks identified above are documented and managed on the risk register managed by the Project Manager.

4.2 Project Description and Physical Features

4.2.1 Historical Meteorological Conditions

The M2G Water Transfer Project area is located approximately 25 kilometres south of the city of Queanbeyan and approximately 31 kilometres from Canberra Airport. Average meteorological conditions such as wind speed, wind direction and evaporation rates have been sourced from the Bureau of Meteorology, Canberra Airport[1]. A weather station will be installed at the M2G Site Office to provide site specific weather data (wind speed & direction, rainfall, temperature etc).

Referencing historical climatic data for Canberra Airport indicates that mean daily wind run[2] (km) is greatest from the period September to February with maximum wind gusts (km/h) greatest during the months November to January.

Annual mean 9am wind speed (km/h) at the Canberra Airport is 8.3 km/h (maximum – October, 11.7) whilst the mean 3pm wind speed (km/h) is 17.3 km/h (maximum – October, 20.7). Mean daily evaporation rates (mm) are greatest between November and February.

The wind direction in summer is predominantly from the northwest, southeast and east. In autumn, the predominant wind direction is from the south, southeast and northwest and in winter and spring from the northwest.

This historical information will be used by construction personnel in order to implement timely and appropriate mitigation measures in managing dust related impacts.

4.2.2 Sensitive Receivers

Given the large number of rural residences in close proximity to the project, sensitive receivers are located all around the construction footprint. A summary of potentially affected residences is provided in Figure 4.1 and those that will be monitored for air quality impacts (dust deposition gauges) throughout construction are provided in Appendix A. During the background monitoring process, this summary will be refined and updated to reflect sensitive receivers that are most likely to be affected by dust generated by construction activities.

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[1] Queanbeyan Bowling Club Meteorological Station does not have historical data for wind direction, speed and intensity and the BWA has had to rely on historical data from Canberra Airport.

[2] Mean daily wind run is the average daily wind run measured during a calendar month or year, calculated over the period of record. Daily wind run is measured at 9 am local time and is an indication of the average wind speed over the previous 24 hours. For example, a mean daily wind run of 240km over a 24 hour period equates to a mean wind speed of 10km/h.

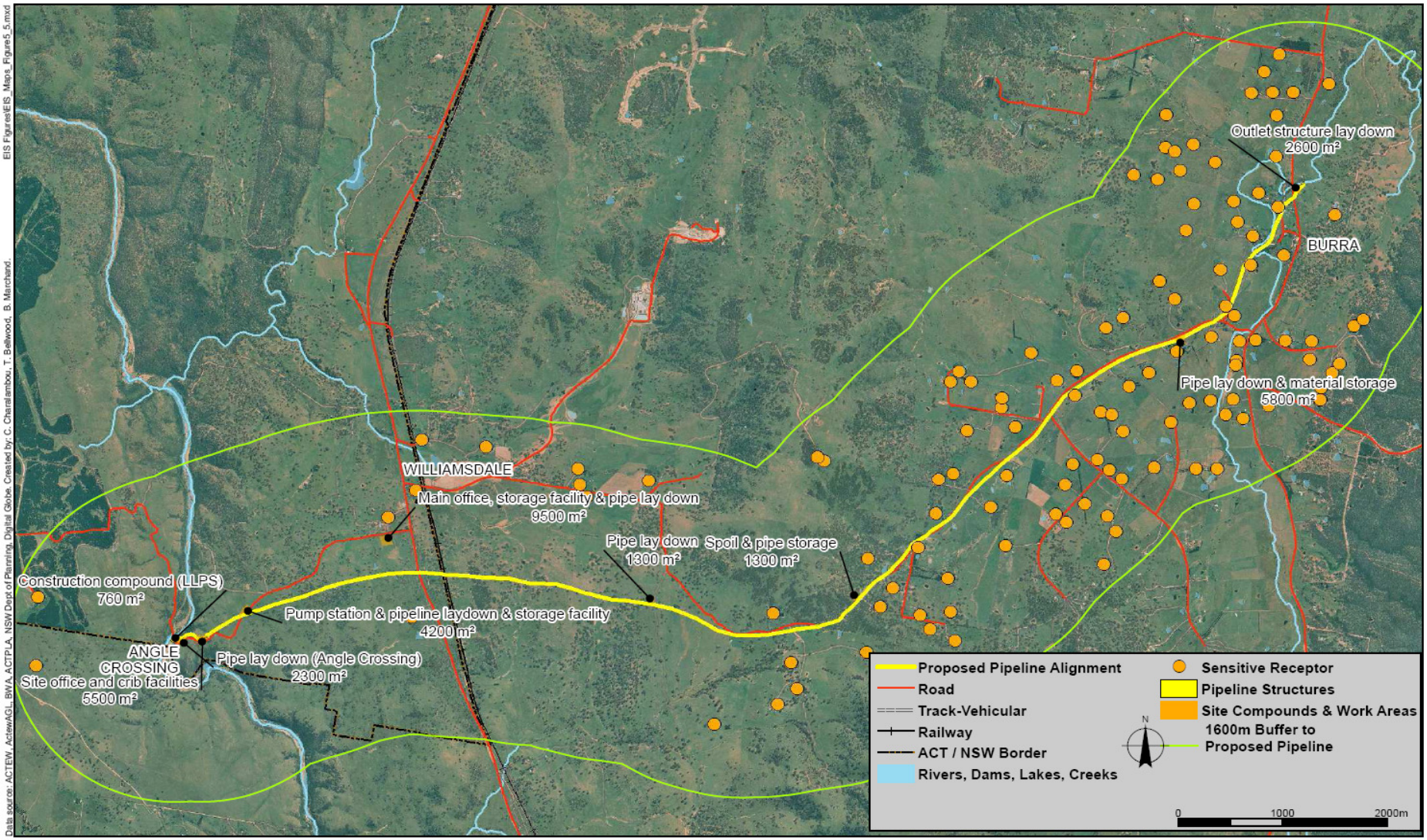

Figure 4.1 Construction site and sensitive receiver location

5 Environmental Controls and Mitigation Measures

The implementation of various environmental control measures during the course of construction can reduce the risk category of environmental aspects associated with the project (i.e. controlling the risk). In addition to implementing "best management practices" on site, the following environmental control measures will be implemented on site to minimise environmental impacts associated with construction activities.

5.1 General Measures

Sections 5.1.1 and 5.1.2 outline the general mitigation measures that will be implemented on the project.

5.1.1 Weekly Environmental Checklists

Appropriate planning is crucial to effective management of dust on site. Weekly environmental checklists will detail the effectiveness of dust management measures on site and whether dust is causing an issue to nearby sensitive receivers.

5.1.2 Environmental Work Method Statements (EWMS')

A detailed description of EWMS' and their application is detailed in the Murrumbidgee to Googong Transfer CEMP. However in summary, EWMS' are documents detailing proposed work procedures and specific environmental control measures for activities.

Potential EWMS' that address air quality issues will include the following activities:

- Clearing and Grubbing;
- Topsoil Stripping and Stockpiling;
- Trenching, Lower and Lay and Backfilling Trench
- Drilling and Blasting

5.2 Specific Mitigation Measures

In addition to the above, the following specific mitigation measures will be implemented on site to manage air quality issues associated with the project activities.

The following environmental mitigation measures are designed to provide practical procedures for the management of air quality impacts on site. In addition, Table 5.1 details the person(s) responsible for the implementation of each control measure and the timing/frequency of application.

Table 5.1 Mitigation Measures

Ref	Control Measures and Safeguards	Responsibility	Timing / Frequency
A1	Identify dust generating activities and potential sensitive receivers at the planning phase and implement appropriate mitigation measures accordingly.	Environmental Manager/ Project Engineers	Pre - construction
A2	Provide advance notice to residents and sensitive receivers	CESM Manager	Pre-

Ref	Control Measures and Safeguards	Responsibility	Timing / Frequency
	prior to commencing dust generating activity.		construction
A3	Environmental training on dust minimisation strategies and practices will be delivered to construction personnel	Environmental Officer	During Construction
A4	Establish a protocol for handling dust complaints that includes recording, reporting and acting on complaints	Environmental Manager / CESM Manager	Pre-construction
A5	Ensure that site compounds, plant yards, and ancillary facilities are established away from sensitive receivers to avoid potential dust impacts.	Project Engineer/ Superintendent	Pre-construction
A6	Stockpiles are to be located as far as practicable from residential areas, areas of remnant bushland and watercourses.	Site Engineer	At all times
A7	Limit vegetation clearing and ground disturbance to an absolute minimum required for construction activities	Project Engineer/ Superintendent/ Foremen	Clearing operations
A8	Where practical, undertake progressive clearing to minimise the amount of area exposed at any one time	Project Engineer/ Superintendent	Clearing operations
A9	Stockpiles, roads and handling areas will be maintained in a condition that minimises wind blown or traffic generated dust. Areas that may be inaccessible by water carts will be kept in a condition which minimises wind blown or traffic generated dust using other means such as mulching as approved by the EPA.	Superintendent/ Foremen	At all times
A10	Administration access roads and standing areas will be hard surfaced.	Project Engineer	Pre-construction
A11	Modify construction activities during high or unfavourable wind conditions.	Project Engineer/ Superintendent	During high wind conditions
A12	Ensure that all plant are operated by experienced personnel and maintained to manufacturer's specification.	Foremen	At all times
A13	Construction equipment will be properly maintained and used to control smoke emissions.	Superintendent	At all times
A14	Start up of vehicles will where practicable or relevant be undertaken away from sensitive receivers	Foremen	At all times
A15	Water sprays, sprinklers and water carts will be employed to adequately dampen stockpiles, ROW, work areas and exposed soils to prevent the emissions of dust from the site. Water application rates shall be aligned with the prevailing climatic conditions, particularly temperature, rainfall, and wind speed/direction.	Superintendent	At all times
A16	Ensure that vehicles travel at speeds that do not generate excessive amounts of dust.	Superintendent/ Foremen	At all times

Ref	Control Measures and Safeguards	Responsibility	Timing / Frequency
A17	Progressively rehabilitate/stabilise disturbed areas to minimise the potential for wind blown dust.	Project Engineer/ Environmental Officer	At all times
A18	All trucks entering or leaving the site will have loads covered prior to entering public roads.	Foreman	At all times
A19	No dust, soil or mud will be deposited from any vehicle on public roads. All drivers of construction vehicles will utilise controls including cattle grids or rumble bars, prior to leaving the works area and entering public roads.	Superintendent	At all times
A20	Visual inspections of public roads leading to the construction works area will be conducted during days when construction activities are occurring. The frequency of such inspections will be at least once daily when muddy on-site conditions are prevalent. All sealed roads will be swept of dust as required.	Superintendent / Foremen / Environmental Officer	During Construction
A21	Sediment will be removed from behind filter fences and other erosion control structures on a regular basis so that collected silt does not become a source of dust generation	Environmental Officer	Weekly
A22	There will be no open burning or incineration on site.	Superintendent	At all times
A23	Any potential odorous emissions will be identified and assessed as to their potential to create odour nuisance at sensitive receptors.	Site Engineer/ Environmental Officer	When odorous emission is identified
A24	Where odour is assessed as presenting a complaint risk, an investigation as to the cause of the odorous emission will be undertaken within 24 hours and remedies implemented to reduce the odour level to within acceptable levels.	Environmental Manager/ Environmental Officer	Upon receiving a complaint or following assessment
A25	Switch off engines of plant parked next to residents when not in operation	Superintendent / Foremen	During Construction
A26	Stockpiles of soil or other materials used along the route will be monitored to assess whether these present a significant source of dust; in which case, they will be covered to minimise emissions.	Site Engineer/ Environmental Officer	At all times
A27	An inspection of all dust control components of large stockpiles should be undertaken on a monthly basis.	Site Engineer/ Environmental Officer	At all times
A28	Depositional dust gauges will be installed at selected sensitive receiver to monitor dust during construction activities in accordance with regulatory licence requirements	Environmental Officer	During Construction
A29	Implementation of and adherence to the Drilling and Blast Management Plan	Superintendent	During Construction
A30	Where practical, materials with lower resulting emissions will be	Engineers	At all times

Ref	Control Measures and Safeguards	Responsibility	Timing / Frequency
	utilised.		
A31	Water used for dust suppression will be obtained from the Murrumbidgee River or East of Gibraltar Gap Burra Creek	Environmental Officer	During Construction

5.2.2 Stockpile and Cleared Areas

Stockpiles and other cleared areas are to be managed in accordance with the relevant EWMS's (e.g. EWMS 01-Clearing and Grubbing, EWMS 02-Topsoil Stripping, EWMS 03-Stockpilng and Construction of ROW, EWMS 09- Trenching, Lower and Lay, and Backfilling Trench) with a focus on minimising the loss of material and generation of dust emissions. The BWA will proactively manage stockpiled and cleared areas using a number of potential management techniques and practices to avoid dust generation including:

- Watering stockpiles and disturbed areas on a regular basis to prevent dust generation;
- Dust Suppression via water carts and/ or a commercial dust suppressant such as Dustex;
- Stabilising temporary stockpiles and exposed areas as soon as practical with a cover crop;
- Stabilising and revegetating permanent stockpiles with a vegetative cover-crop;
- Restricting vehicle access during inclement weather;
- Locating stockpiles away from sensitive receivers and watercourses in sheltered locations protected from prevailing winds;
- Assessing forecasted climatic conditions and proactively increasing the frequency of watering prior to the onset of hot weather or windy days;
- Applying mulch or alternatives over exposed areas or newly stabilised areas as part of landscape rehabilitation works;
- Where practical, sealing haul roads and hardstand areas; and
- If required, utilising chemical binders and polymers to stabilise exposed areas, haul-roads and stockpiles.

5.2.3 Right of Way (ROW)

The ROW is a temporary access track that runs alongside the proposed pipeline and provides plant and vehicular access for the construction of the pipeline. The Row will be constructed with a surface layer that has a low dust generation potential which may be sprayed with a dust suppression agent such as Dustex to further minimise the generation of dust along the ROW as necessary.

5.2.4 Reactive Management Program

In the event an exceedance of dust emissions (concentrations above those presented in Tables 2.2) is recorded at any dust monitoring location or a complaint is received regarding air quality, the Environmental Manager will conduct an investigation to determine the potential parameters of influence that could have led to the exceedance.

The investigation will examine:

- the quantity of exposed areas, which may potentially generate dust;
- whether there is potential to revegetate these areas;

- whether there were any identified days of excessive high wind during the monitoring period;
- the number of water-trucks operating within the area during the monitoring period; and
- an examination of construction activities conducted during this period.

If deficiencies are identified and non-compliances with the environmental requirements and the targets of this AQMP observed, a non-compliance report or Environmental Improvement Notice (EIN) will be issued and relevant actions/mitigations will be enforced. This investigation and subsequent report will be presented for discussion at the regular ERG meetings.

6 Communication and Consultation

6.1 Community Engagement and Stakeholder Management

Close community liaison will be maintained to ensure that local residents are aware of the times and durations when they may be affected by construction work and to provide an avenue for communication between the community and the Bulk Water Alliance.

All communication and consultation will be undertaken in accordance with the project Community Engagement and Stakeholder Management (CESM) Plan. The CESM Manager is responsible for the interface with the community. This includes (but is not limited to) notification of construction activity, notification of temporary road closures, community engagement regarding construction (including activities that may generate dust) and the complaints process. The CESM Manager reports to the M2G Client representative whilst working in conjunction with the M2G Project Manager, M2G Construction Manager, Site Superintendent, M2G Environmental Manager and Project Engineers.

In addition, consultation with government agencies will be undertaken regularly as described in the CEMP with the intention of reviewing the effectiveness of the AQMP, site management practices, monitoring results and any other relevant issues.

Table 6.1 Communication Network

Communication	
Project personnel including sub-contractors/suppliers	• A site induction and environmental training will be provided to all personnel and sub-contractors engaged to work on the site. • Feedback on environmental matters, new legislation etc. will be provided and encouraged. • Close communication will be maintained between the Construction Manager, M2G Environmental Manager, Foremen and Environmental Officer.
Government agencies	**ACT** • Department of the Environment and Sustainable Development (E&SD) • Parks, Conservation and Lands (TAMS) • ACT Heritage Unit **NSW** • Environment Protection Authority (EPA) • Department of Planning (DoP) • Australian Rail Track Corporation (ARTC)
Community and Landholders	• Individual Landholders will be informed in advance of construction activity affecting them in accordance with the CESM Plan • Project information will be made available to the community in accordance with the CESM Plan through advertisements, community notices and newsletters. • A protocol for registering and responding to complaints will be established as detailed in the Complaints Management Procedure and CESM Management Plan.

6.2 Complaints Management Strategy

The Bulk Water Alliance is committed to managing dust and odour related complaints from affected residents or stakeholders in a proactive and conciliatory manner.

Relevant community and stakeholder groups will be progressively informed of the various stages of construction by the Community Engagement and Stakeholder Management (CESM) team, particularly prior to significant construction generating activities related to soil and water management.

The community and stakeholder groups identified in the CESM Plan will be informed of the duration of the works, what impacts that they are likely to expect and they will be given a 1800 toll free number to contact the BWA CESM team should they wish to register a complaint regarding any aspect of the construction project, not just soil and/or water related impacts.

The BWA CESM team will implement a process for registering and responding to the lodged complaint as per the Complaints Management Procedure. The CESM Manager will report back to the project team on impact and mitigation effectiveness on a weekly basis.

The Water Security Hotline phone number (6248 3563) is available during business hours for general questions, project updates and to provide feedback. A toll free number (1800 211 242) is available 24 hours a day for emergencies. Complaints and comments can also be sent via email to watersecurity@actew.com.au.

7 Training

Three main forms of training will be implemented on site:

- site induction;
- environmental management training; and
- “toolbox” training

Records of all site inductions and on site training will be kept on a database, including details of the training topic(s) presented, participants and training dates. All participants will be required to “sign-off” that they have been informed and understand their environmental obligations at the conclusion of each training session.

Training will generally be prepared and delivered by the Environmental Officer, or by personnel delegated by the M2G Environmental Manager.

7.1 Site Induction

Prior to working on site, all personnel and subcontractors will undertake a site induction detailing significant environmental and OHS requirements associated with the M2G project. An air quality component will be included in the site specific induction for all personnel and sub-contractors undertaking work on the M2G project. This will include, but not be limited to, the following environmental components.

- The EMS and CEMP (purpose, objectives, etc) and the requirements of the AQMP;
- Legal requirements including due diligence, duty of care and potential consequences of infringements;
- Environmental responsibilities;
- Conditions of licences, permits and approvals;
- BWA policies (including the Shared Road Policy);
- Significant environmental issues and areas of the site, including the identification of project boundaries, location of refuse bins, washing, refuelling and maintenance of vehicles, plant and equipment;
- Environmental management techniques for key environmental elements (dust, odour, soil and water, waste and recycling, flora and fauna, heritage etc) e.g. EWMS;
- Incident management and emergency plans;
- Reporting process for environmental harm/incidents;
- Protection and maintenance of environmental controls; and
- BWA sustainability objectives.

7.2 Environment Management Training

Targeted environmental management training will be provided to individuals responsible for environmental management on site, or groups who are undertaking activities which have been identified as “high risk”. This environmental training is designed to achieve a level of awareness and competence appropriate to their assigned activities.

Specific links will be made between environmental objectives and sustainability principles during training sessions (where possible). A comprehensive overview of sustainability may also need to be included (i.e. social, economic and environmental aspects, and inter-generational equity).

Training will be provided by a qualified trainer and will include the following aspects:

- Relevant legislation and approvals
- Dust and odour management
- On site field planning

Records will be maintained on site of all training sessions conducted and personnel attendance. These records will be maintained by the Environmental Officer.

7.3 Toolbox Training

Toolbox training will help to ensure that relevant information is communicated to the workforce and that feedback can be provided on issues of interest or concern. Toolbox training will generally be prepared and delivered by the Project Engineers, Superintendent, Site Foreman and/or the Environmental Officer and will reflect risks and concerns associated with construction activities occurring on site.

EWMSs will draw reference to specific toolboxes based on risks associated with the proposed construction activity. Environmental toolboxes on dust management will be delivered to site personnel as required to further supplement the information delivered during the site induction. Depending on its application, environmental toolboxes can be utilised as a general training instrument (i.e. dust management on site) or can be tailored to supplement a EWMS by providing specific dust management strategies for identified activities that have the potential to generate significant dust impacts (i.e. excavation dust management).

Figure 7.1 Example of a dust management toolbox

8 Inspection, Auditing & Monitoring

8.1 Overview

Dust-control procedures mentioned above will be implemented by the M2G construction crews on a day-to-day basis to manage and pre-empt dust emissions generated as a result of construction activities. The effectiveness of implemented controls on site and this operational management plan will be assessed through a series of inspections, monitoring programs and audit schedules to assess compliance. Compliance with this management plan and implementation on site will predominantly be carried out by the Environmental Officer, although Site Engineers, Foremen and the Superintendent will also be responsible for monitoring compliance.

8.2 Inspection

Informal on site inspections will be undertaken during the course of construction. Foremen and the Superintendent will predominantly undertake these informal inspections due to their regular presence on site. The Environmental Officer will also assist in these inspections when present on site.

If dust generating activities are identified during these inspections, additional dust management controls will be implemented to minimise potential dust impacts. These inspections will not be formally documented unless serious concerns are identified.

8.3 Monitoring

Approximately two months of background monitoring, to determine baseline dust levels, will be undertaken prior to construction commencing.

8.3.1 Background Dust Deposition Monitoring

To take the existing background concentrations into account when assessing the potential impact on sensitive receivers, monitoring of existing dust deposition rates will be undertaken in strategic locations where construction activities have not commenced.

8.3.2 Dust Deposition Monitoring

Depositional dust monitoring will be undertaken monthly during construction to assess the effectiveness of mitigation measures implemented on site. Monitoring results will be compared against NSW EPA dust goals for the length of the pipeline in the absence of ACT targets. The maximum acceptable increase in the mean annual dust deposition rate will be 2 g/m2/month in those areas where the existing dust fallout rate does not exceed 2 g/m2/month. The aim of the dust fallout criteria will be to limit the total dust deposition rate to 4 g/m2/month.

Results will be displayed on site to advise personnel of progress and areas of improvement/increased observation.

Dust monitoring will comprise of depositional dust gauges and specific compliance points will be identified within the relevant licences for ACT and NSW. Gauges will run for 30 days (± 2 days) and will be analysed for total solids, ash residue and combustibles. Gauges will be placed at sensitive receiver locations where practical and at sites identified as high risk areas.

The M2G ACT Environmental Authorisation will specify the locations for depositional dust compliance monitoring in the ACT portion of the project and the NSW Environment Protection Licence will specify the locations in the NSW portion.

The Air Quality Monitoring Plan in Appendix A of this document provides further details on monitoring locations, frequency and sampling techniques.

8.3.3 Odour

No significant existing sources of odour have been identified along the project corridor. Therefore, no odour monitoring has been undertaken to date and it is unlikely that odour monitoring will be undertaken unless an issue arises that warrants this monitoring. Consultation with the relevant ACT and NSW agencies will be undertaken as required.

8.3.4 Weekly Checklists

Environmental monitoring will also be undertaken in the form of an Environmental Inspection Checklist (refer to the CEMP) which will be completed by the Environmental Officer once a week and filed on site. When practical, the Foremen and/or Superintendent will assist in the completion of this checklist and contribute to assigning appropriate mitigation measures.

During inclement weather (i.e. extremely hot or windy weather) the frequency of these checklists may be increased to assist with proactive management of potential dust impacts. Meteorology monitoring will assist with the identification of forecasted inclement weather.

8.3.5 Meteorology Monitoring

Daily monitoring of adverse weather forecasts obtained from the BOM website and/or the Elders website (listed below) will assist site personnel prepare for inclement weather and pre-empt potential dust impacts. Based on these forecasts and the level of exposure, site personnel will assess the requirement to implement additional dust mitigation controls.

- Bureau of Meteorology (http://www.bom.gov.au)
- Elders (http://www.eldersweather.com.au/act/southern-tablelands)

8.3.6 External Inspections

External inspections will be held in consultation with the ACT EPA, NSW EPA and other Regulatory Authorities to inspect the site and operating procedures. These inspections will be documented with all agreed outcomes documented in an Environmental Maintenance Action & Observation Checklist for actioning

8.3.7 Independent Auditor / Environmental Representative (IER)

Details of the independent auditor / environmental representative (IER) have been summarised within the CEMP. In general, the IER will assess compliance against project conditions and licences during the course of construction as well as adherence and compliance with the Construction EMP and related sub-plans.

8.4 Auditing

Periodic audits of the AQMP are detailed within the CEMP Audit Schedule.

Audits will include:

- A full site inspection
- Compliance with legislative requirements and project approvals
- Compliance with this AQMP
- Full review of environmental records (e.g. checklist and inspections)
- Review of monitoring results
- Closure of non-conformances and previous audit findings
- An assessment of the suitability of the AQMP with regards to current construction activities. This may initiate a AQMP review/revision
- Recommendations for further improvements

8.5 Non-conformance, Preventative and Corrective Actions

8.5.1 Environmental Actions Lists and Improvement Notices

The M2G Environmental Officer will issue SQE Inspection / Site Instruction for environmental maintenance, observations and action lists or an Environmental Improvement Notice (EIN) as required. SQE Inspection / Site Instruction will be issued to the Superintendent and/or Foremen for deficiencies that are minor in nature but require rectification. An Environmental Improvement Notice (EIN) will be issued for more serious deficiencies which pose a greater level of environmental risk, or for when a reprimand is required for poor performance.

8.5.2 Resolving Non-conformances and implementing Corrective Actions

The process for managing environmental non-conformances will be as follows:

- When an environmental non-conformance is detected, the nature of the issue will be evaluated by the BWA Environmental Manager and/or M2G Environmental Officer and the requirement for new or additional controls will be discussed to prevent reoccurrences. Corrective actions will subsequently be identified and entered into the Environmental Action Register (EAR) for reference. This EAR will detail the non-conformance, corrective and/or preventative action, timing and the personnel responsible for implementing the action. The non-conformance will remain “Open” until corrective actions have been implemented.
- Once the corrective action has been implemented, the EAR will be updated to “Closed” status with details of the closure date attached.
- The EAR will be reviewed regularly by the Environmental Team to ensure actions are being completed in a timely manner. Any issues arising from these reviews will be discussed between the BWA Environmental Manager and relevant construction personnel.

8.6 Environmental Records

The M2G Environmental Manager with the assistance of the Environmental Officer will maintain the following records:

- The AQMP;
- Relevant approvals, regulatory licences and permits;
- Inspection records and checklists;
- Environmental monitoring results and chain-of-custody forms;
- Environmental accident/incident/emergency reports;
- Environmental Non-conformance and EIN documentation;
- Audit reports;
- Management review minutes and action taken

Where hard copy records are provided they will be scanned and made available electronically. Each set of records will be allocated a register/index for easy reference and filing. Records will be maintained for at least 5 years after the date of final completion and will be available to ACTEW Representatives and Regulatory Agencies as required.

8.7 Document and Data Control

All environmental documentation associated with this management plan will be documented and maintained on site in accordance with "*document and data control"* requirements detailed in the CEMP.

9 Review and Improvement of the AQMP

The outcomes of inspections, monitoring, audits and the completion of checklists will facilitate the identification of problems, recurring issues or areas for improvement. Where identified, the effectiveness of this AQMP will be reviewed and opportunities for improvement will be identified and discussed with site personnel.

A system for the review and improvement of the environmental management system is detailed in the CEMP.

Table 9.1 should be utilised to annotate identified amendments in between annual reviews.

Table 9.1 Review Register

Reference	Amendment Required	Status

Appendix A **Air Quality Monitoring Plan**

ACTEW CORPORATION | ActewAGL Always.

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Murrumbidgee to Googong Water Transfer - Air, Noise and Vibration Monitoring Plan

BWA-M2G-EN-ECP-010-1

January 2012

Delivered by the Bulk Water Alliance

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Certificate of approval for issue of documents

Document number	BWA-M2G-EN-ECP-010-1
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	Position	Name	Signature	Date
Prepared by	Land and Compliance Manager	John Turville		September 2012
Reviewed by	Land and Compliance Manager	John Turville		January 2012
Approved by	Project Manager	Jason Julius		

Document revision control

Version	Author	Date	Description	Approval
1	John Turville	16 January 2012	Annual Review	
2	Peter Sheehan	14 Feb 2012	Audit Actions	JT

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ACTEW CORPORATION

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Contents

1 Introduction

Monitoring air, noise and vibration impacts is a central component of the M2G Construction Environment Management Plan, as well as the Air Quality Management Plan and Noise and Vibration Management Plan which were prepared as part of the CEMP, which allows us to better identify and manage the impacts that construction activities are having on sensitive receivers.

This Air, Noise and Vibration Monitoring Plan has been prepared as a supplement to both the Air Quality Management Plan (AQMP) and the Noise and Vibration Management Plan (NVMP) to assist in undertaking the monitoring requirements for the project.

Construction noise, vibration and air quality monitoring undertaken by Bulk Water Alliance (BWA) includes the following:

- Dust – deposition.
- Noise (routine and complaint response).
- Vibration – ground borne and
- Blasting – blast overpressure.

Air, noise and vibration monitoring will be conducted on a monthly basis at each of the identified monitoring locations. Additional monitoring can be conducted at locations where complaints relating to air quality, noise or vibration are received. These will be assessed on a case-by-case basis.

Procedures relating to the type of monitoring, details on monitoring locations and guidance notes for undertaking monitoring are provided below.

2 Monitoring Locations

Air, noise and vibration monitoring will be conducted at sensitive receiver locations adjoining the pipeline during construction. The aim of this monitoring is to check compliance against the adopted noise and vibration goals listed in the NVMP. Therefore, the focus of this monitoring is on the receivers with the greatest potential to exceed recommended levels. Generally this is the receivers that are closest to the areas of construction.

The identified monitoring locations are shown in Table 2.1.

Table 2.1 Identified Monitoring Locations

Monitoring Location Number	Resident contact or Surname	Approximate Address	Distance to construction works or construction traffic
1	Block 108. District Tennent	Angle Crossing Road, ACT	1200 metres
2	Moore. Block 1470	Cnr Monaro Highway and Angle Crossing Road, ACT	130 metres
3	Block 1675	Monaro Highway, ACT	140 metres
4	Johanson	Williamsdale Road, NSW	150 metres
5	Barton	Williamsdale Road, NSW	150 metres
6	Blinksell (noise) Bos (air)	Williamsdale Road, NSW (near Keewong Lane)	100 metres
7	Motbey	Williamsdale Road, NSW	120 metres
8	Latimer	Williamsdale Road, NSW	140 metres
9	Hanns	Williamsdale Road, NSW	70 metres
10	Johnston	Williamsdale Road, NSW	110 metres
11	Podmore	Burra Road, NSW	100 metres

Appendix A shows maps of the identified monitoring locations.

3 Monitoring Procedures

3.1 Standards and Guidelines

Air, noise, vibration and blasting monitoring will be conducted with consideration to the relevant guidelines and standards, including:

ACT

- Noise Environment Protection Policy, Environment Protection Authority, January 2010.
- Air Environment Protection Policy, Environment Protection Authority, November 1999.

NSW

- DECCW Interim Construction Noise Guidelines (2009);
- DECCW Assessing Vibration: a technical guideline;
- DECCW Environmental Noise Control Manual (ENCM);
- DECCW Environmental Criteria for Road Traffic Noise (ECRTN), May 1999; and
- DECCW Industrial Noise Policy 2000.

OTHER (Vibration)

- German Standard DIN 4150, Part 3;
- British Standard BS7385: Part 2-1993;
- British Standard BS6472: 1992; and
- ANZECC Guidelines “Technical Basis for Guidelines to Minimise Noise Annoyance Due to Blasting Over Pressure and Ground Vibration” (Sept 1990).
- AS 1055 – 1997 Acoustics – Description and Measurement of Environmental Noise.
- British Standard BS 6472–1992, Evaluation of Human Exposure to Vibration in Buildings (1–80 Hz).
- German Standard DIN 4150, 1999. Part 3, Structural Vibration – Effects of Vibration on Structures.
- AS 2187.2 –2006 Explosives – Storage and Use Part 2: Use of Explosives.
- Department of Environment, Climate Change and Water (NSW) – Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales (2000).

The following equipment may be used for air (dust), noise and vibration monitoring, subject to statutory approval conditions:

- Dust gauges.
- Sound level meters or environmental noise loggers
- Vibration loggers.
- Blast monitors.
- Anemometer or automatic weather station

Local wind and meteorological conditions have a significant influence on the propagation of air pollutants and noise from a source. For this reason, a weather station will be set up on site (or a representative location) to monitor and record weather conditions including:

- Wind speed.
- Wind direction.
- Ambient temperature.
- Relative humidity.
- Rainfall.

The equipment used for the measurements will have current calibration certificates and will be appropriate for the measurements with regards to the relevant Standards.

3.2 Air Quality

Dust is a generic term used to describe fine particles that are suspended in the atmosphere. Deposited dust refers to any dust that falls out of suspension in the atmosphere. Activities that have been identified as possible sources of dust emissions are:

- Clearance of vegetation, rock and soil material.
- Material handling e.g. excavation.
- Vehicle induced dust emissions on haul routes.
- Loading and dumping of cleared material.
- Leveling and grading of disturbed soil surfaces.
- Passage of construction and administrative vehicles over unsealed sections of road or localised unconsolidated soil surfaces.
- Wind erosion of all unstable/uncovered stockpiles and other unconsolidated surfaces.

3.2.1 Deposited Dust

Deposited dust is measured in accordance with AS/NZS 3580.10.1:2003 *Methods for sampling and analysis of ambient air* and all dust gauges are sited in accordance with AS 2922-1987 Ambient air – *Guide for the siting of sampling units*.

Dust deposition is measured using gauges. This method measures dust deposition rate and involves the passive deposition and capture of dust within a funnel and bottle arrangement. Data is usually collected over monthly periods and results are expressed in g/m2/month (i.e. the mass of dust deposited per m2 per month).

The principle of the technique is that, over a given sampling period, particles that settle from the ambient air are collected in a vessel together with any rainwater. The sample mass deposition rate of deposited matter is calculated from the mass of solids obtained, the funnel cross-sectional area and the exposure period (i.e. one month).

Subject to approval and licence conditions, a deposited dust gauge and stand will be placed at each of the selected monitoring locations. In siting, it is important to maintain a minimum of 5 m from any trees or obstacles, unrestricted air flow around the sampling inlet and clear sky angle of 120º above the inlet. An example of a dust deposition gauge is shown in Figure 3.1.

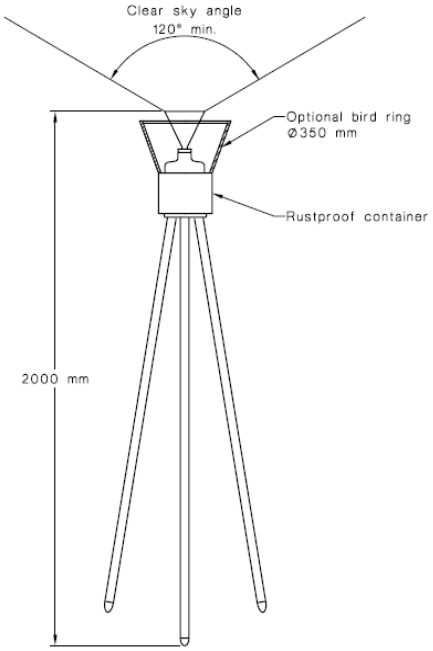

Figure 3.1 Typical Dust Deposition Stand with Gauge

3.3 Noise

If required, environmental noise monitoring will be carried out at the most affected receivers with regards to the activities being monitored. Measurements will typically be based on operator attended monitoring so that construction noise and vibration sources can be readily identified.

Some guidelines for noise monitoring procedures are outlined below:

- Noise monitoring is to be undertaken using a sound level meter (SLM) capable of recording continuous A-weighted noise levels and will capture airborne construction noise levels received external to any sensitive receiver.
- In addition to measuring and reporting overall A-weighted noise levels, statistical L_{90}, L_{eq}, L_{10} and L_{max} noise levels will also be measured and reported in third octave band centre frequencies from 31.5 Hz to 8 kHz.
- Monitoring of construction noise should be undertaken for a minimum of 15 minutes at each monitoring location.
- With consideration to the NSW INP, monitoring should be conducted at the property boundary, or where this is more than 30 metres from the residence, at 30 metres from the most affected façade.

- The SLM should be mounted on a tripod at a height of 1.2 - 1.5 metres above ground level. The SLM should be sited in an open location, away from trees and shielding objects where possible.
- Monitoring should be undertaken on days of light winds (<5 m/s) and no rain. Rain and excessive wind may elevate the ambient noise level. Monitoring should be ceased when wind speeds exceed 5 m/s or when rainfall occurs.

It is important to distinguish between construction noise and other noises such as traffic in order to comment on which is the most dominant and estimate the noise level of construction activities in isolation. The SLM display can be used while monitoring to estimate the noise level from sources dominant at the time, e.g. when no traffic is present and construction equipment is strongly dominant or where construction is inaudible over the traffic. If background noise levels are high (i.e. within 10 dB of construction activity) at receiver locations, monitoring can be conducted closer to construction activity. The distance from construction activity should be recorded to allow for calculations to be made of noise levels at receiver locations, based on attenuation properties.

3.4 Vibration and Blasting

Measurements of blasting activities will be used to assess compliance as well as determine site constants to be used in future calculations.

Construction activities such as rock breaking, excavation and compaction may produce vibration levels that are perceptible within 50 metres of the activity. Therefore, monitoring of vibration levels will only occur when residences are within 50 metres of these activities.

Vibration measurements will capture PPV data for assessment against structural damage and VDV data for assessment against human exposure criteria. Vibration monitoring can be undertaken using a number of vibration monitors and the operating manual should always be referred to.

Blasting measurements will capture PPV data for vibration and linear peak noise levels for overpressure.

Some general guidelines on the setup of vibration monitoring equipment are outlined below:

- The sensor should be placed at the location where vibration is of concern.
- It is important to ensure a good coupling with the ground. The sensor should be placed on a solid surface such as concrete or asphalt paving. If this isn't available, the transducer may be bedded in soil.
- Human exposure to vibration should usually be measured in all three axes (x, y and z), so that the results can be combined and compared to the adopted criteria. Where possible, measurements should be taken where human activity is likely.
- The transducer should be located at a sufficient distance from any structure (including large trees) so as to avoid undue interference from vibration 'feeding back' from the structure.

3.5 Monitoring Records

Each monitoring record will include the following information:

- Date and time of monitoring.
- Activities occurring during monitoring and the location of construction activities.
- Location of monitoring.
- Equipment used and method of monitoring.
- Weather conditions during monitoring.
- Monitoring results obtained.
- A comparison of the results with the adopted goals.
- Recommendations for corrective actions to further minimise impacts where appropriate.

Table 3.1 displays a summary of monitoring tasks over the duration of the construction phase

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3.6 Summary of Monitoring Tasks

Table 3.1 Summary of Air, Noise and Vibration Monitoring Tasks (subject to approval and licence requirements)

Monitoring	Frequency	Duration	Criterion *	Monitoring Locations	Description
Dust – deposition	Continuous	30 days ±2	NSW 4 g/m^2/month ACT - no criteria (adopt NSW criteria) Stipulated in EA 802	Monitoring locations: 1 – 11	Dust gauges are placed at each location for the duration of the project (or while construction work is within 300 metres). The bottles are replaced with fresh bottles at the end of each month.
Noise – monitoring	NSW As least monthly – when construction activity is within 200 metres ACT • 7am to 6pm once a week on alternative days whilst work is being carried out • 6pm to 10pm daily, or time period and frequency agreed to by the EPA* • 10pm to 7am, daily, or time period and frequency agreed to by the EPA* * not required where works ceased	15 minutes	NSW daytime ($L_{Aeq,\ 15\ min}$) 40 dB(A) – noise affected level 75 dB(A) – highly affected noise level Outside recommended standard hours 35dB(A) – noise affected level ACT *Mon –Sat* 7am to 6pm - 60dB(A) 6pm to 10pm - 45dB(A) 10pm to 7am - 35dB(A) *Sun & Public Holidays* 8am to 10pm - 45dB(A) 10pm to 8am - 35dB(A)	Monitoring locations: 1 –11	NSW Monitoring shall be undertaken at each monitoring location at a minimum of once each calendar month. If there is no activity to monitor, this shall be recorded. ACT Construction noise levels shall be monitored at each compliance point during the following periods: i. 7am to 6pm once a week on alternative days whilst work is being carried out within 1000 metres of a compliance point; ii. 6pm to 10pm* daily, or time period and frequency agreed to by the Authority; and iii. 10pm to 7am* daily, or

Monitoring	Frequency	Duration	Criterion *	Monitoring Locations	Description
					time period and frequency agreed to by the Authority. * not required where works have ceased and/or a permanent resident does not reside at the compliance point.
Vibration monitoring	As required when work is within 50 metres	Duration of works or as long as necessary to characterise vibration	NSW VDV for residences during daytime 0.2 $m/s^{1.75}$	Monitoring locations: 1 – 11	When work is being carried out within 50 - 100 metres of a sensitive structure, vibration monitoring shall be undertaken at the sensitive structure at commencement of the activity and during the worst-case scenario (e.g. closest or highest vibration setting). Background monitoring at each sensitive structure should also be undertaken prior to commencement of the activity for comparison purposes. Dilapidation surveys may also be conducted.
Blasting	Every blast	Duration of blast	NSW Airblast Overpressure: 115 dB (Lin peak) Ground vibration: 5 mm/sec ppv ACT Air blast overpressure i. 120dB (Linear Peak) for any blast	Monitoring stations: Closest sensitive receiver. Additional monitoring locations may be required depending on the final location and size of the blast.	When known, the M2G Construction Manager should communicate the location and expected size of the blast to the M2G Environmental Manager.

Monitoring	Frequency	Duration	Criterion *	Monitoring Locations	Description
			ii. 115dB (Linear Peak) for 9 out of 10 consecutive blasts initiated regardless of the interval between blasts. <u>Ground vibration</u> i. 10mm/s for any blast ii. A peak particle velocity of 5mm/s for 9 out of 10 consecutive blasts initiated regardless of the interval between blasts.		

- A full list of project specific criteria can be found in the M2G Noise and Vibration Management Plan (NVMP) and M2G Air Quality Management Plan (AQMP)

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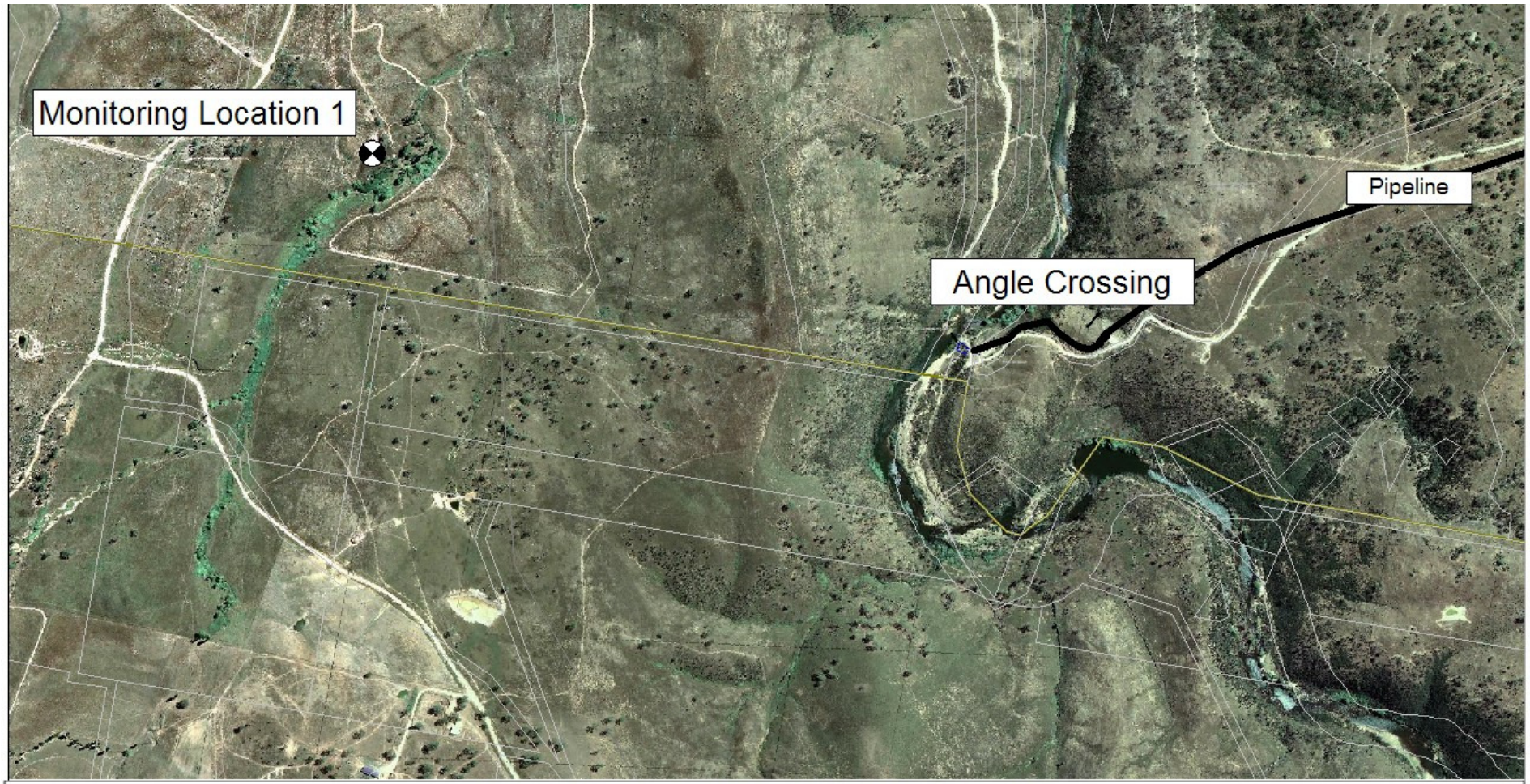
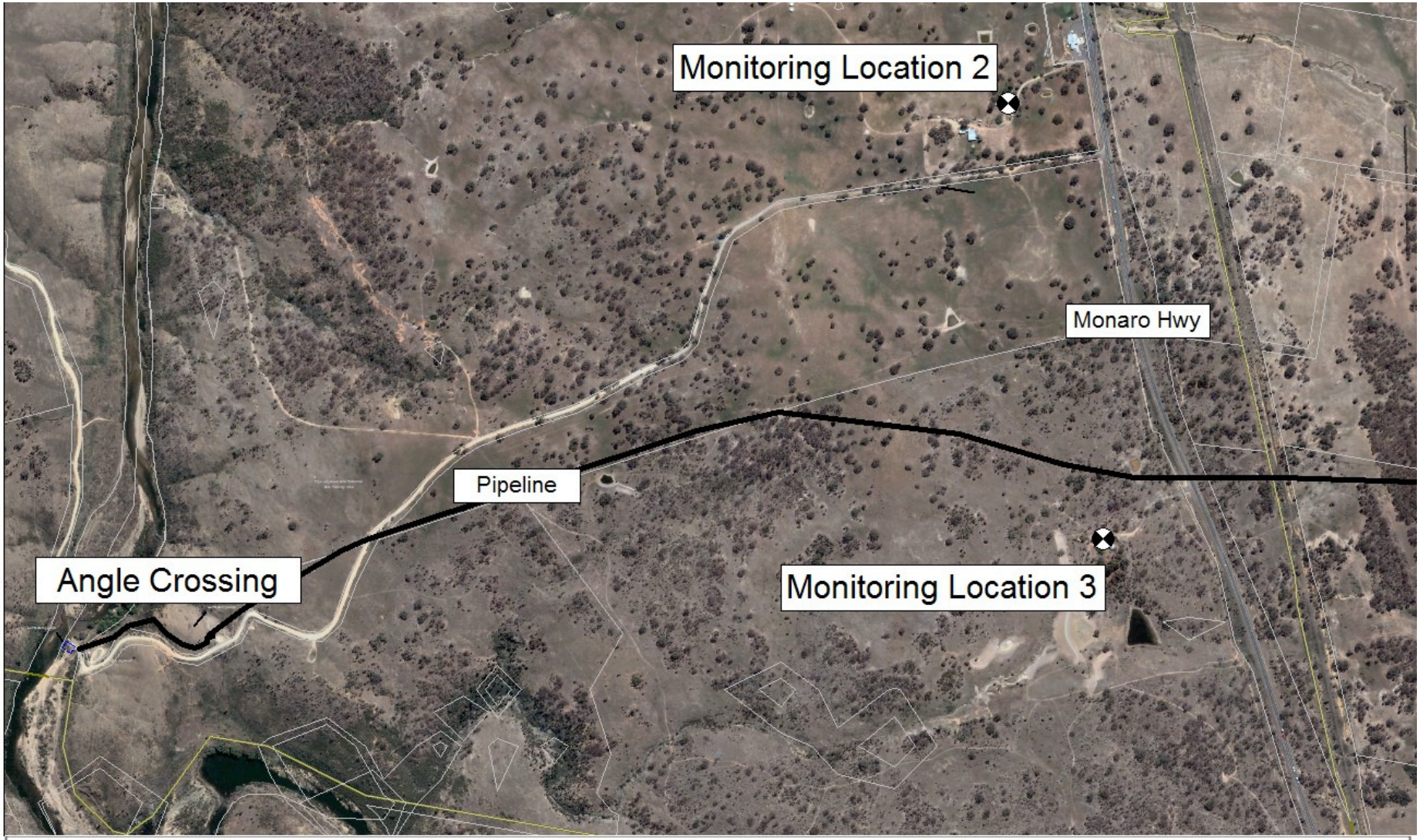
Appendix A **Monitoring Location Maps**



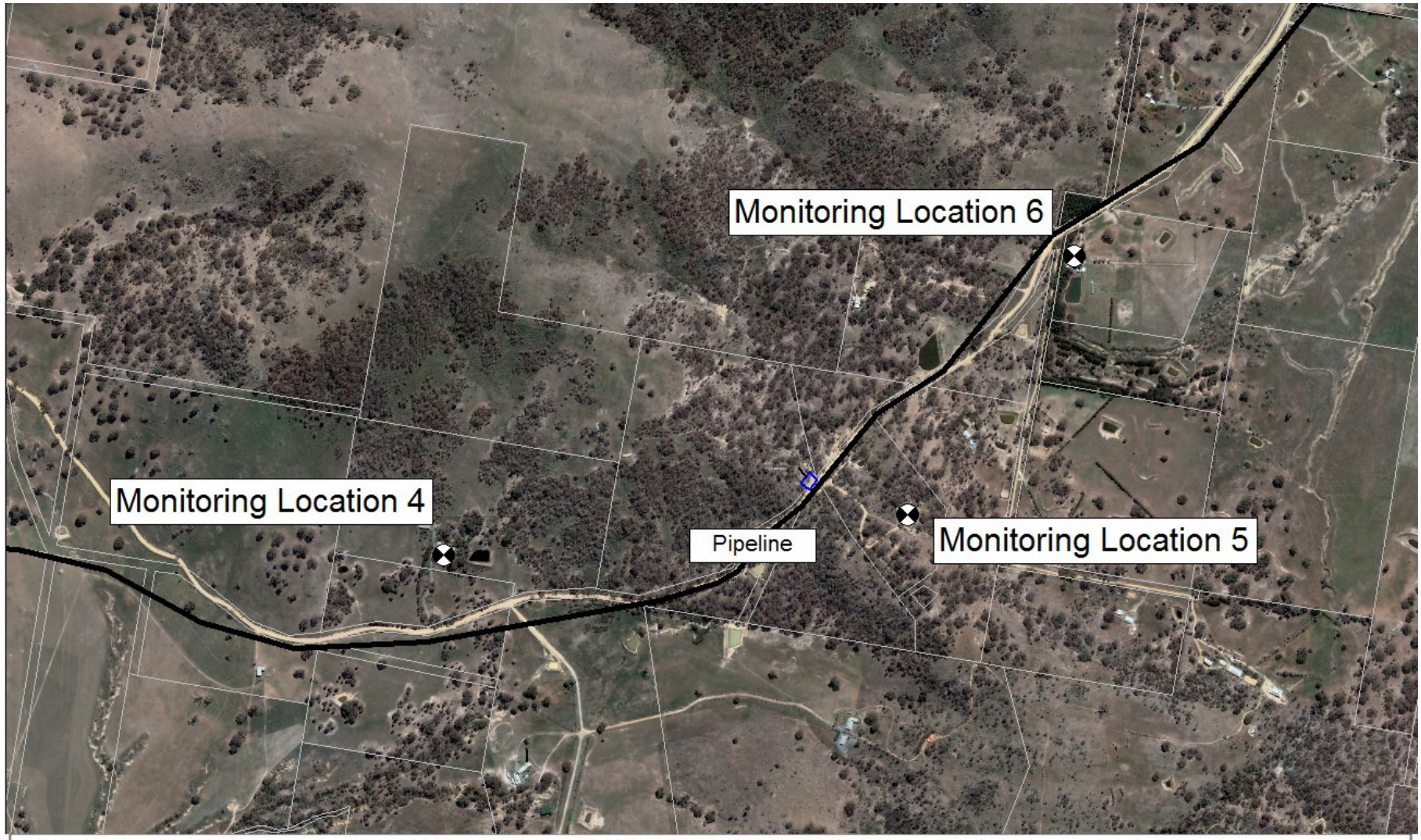
Murrumbidgee to Googong Water Transfer

Bulk Water Alliance



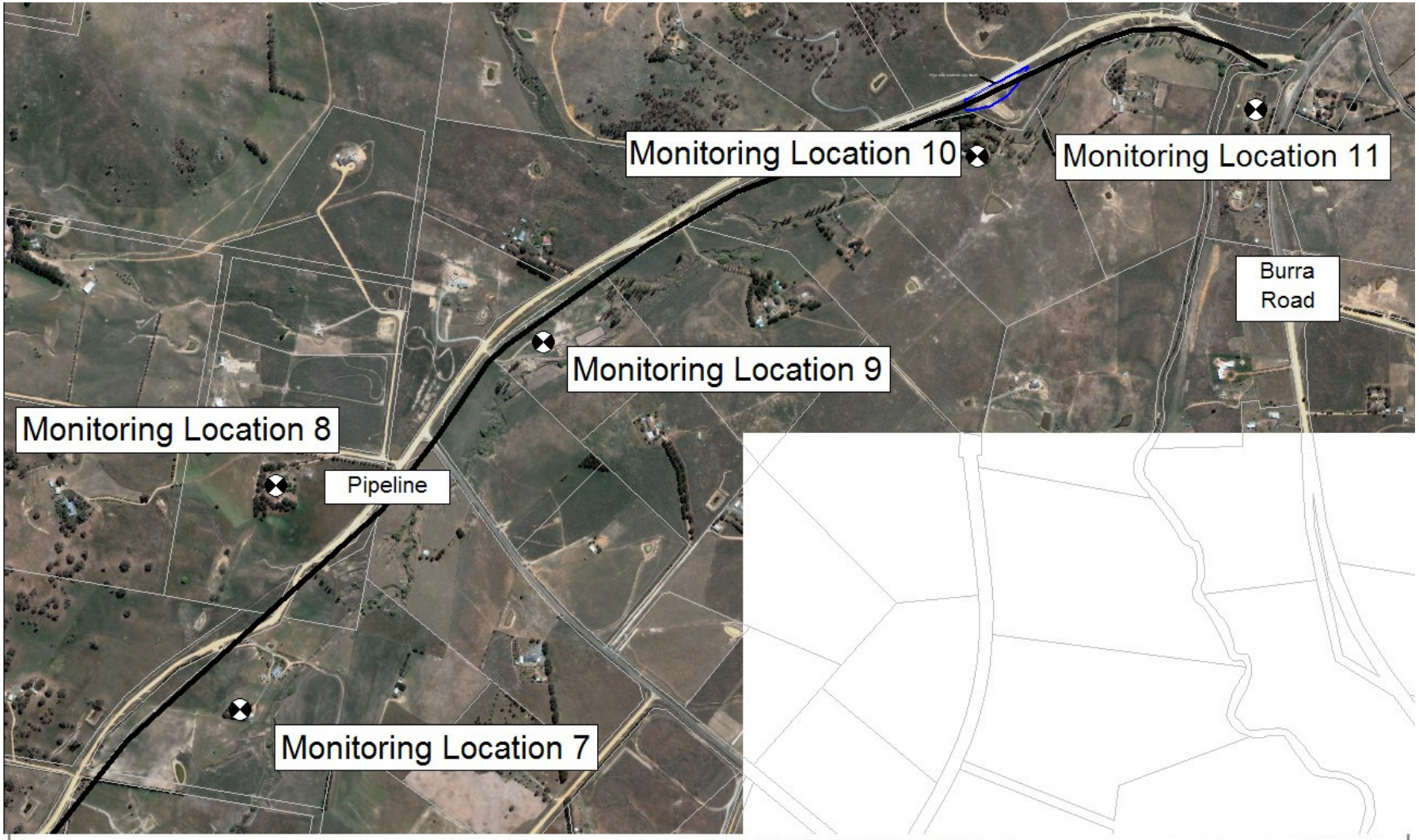
Murrumbidgee to Googong Water Transfer

Bulk Water Alliance



Murrumbidgee to Googong Water Transfer

Bulk Water Alliance


Monitoring Location 10
Monitoring Location 11
Burra Road
Monitoring Location 9
Monitoring Location 8
Pipeline
Monitoring Location 7
Murrumbidgee to Googong Water Transfer
Bulk Water Alliance